Mathematics (Economics, Markets and Finance)

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Exercises sheet 2

Exercise 1. *Find the natural domain of the following functions and compute the equation of the tangent line through the given point.*

a) $f(x)=\ln(x^2+3x-4)$, *through the point* $(10, f(10))$.

b) $f(x)=\sqrt{x^2-x}$, *through the point* $(2, f(2))$.

Exercise 2. *Find where the following functions are increasing/decreasing on their natural domain.*

a) $f(x)=e^{\sqrt{x-3}}$.

b) $f(x)=4x^3-x^2-3x+4$.

c) $f(x)=\dfrac{x}{e^{x^2}}$.

d) $f(x)=\ln(e^x+e^{-x})$.

e) $f(x)=\dfrac{x^2-4}{x-3}$.

Exercise 3. *For the following functions find all local maximum/minum points.*

a) $f(x)=2x^3-x^2+3x-1$.

b) $f(x)=x\sqrt{x+1}$.

c) $f(x)=x+\sqrt{1-x}$.

d) $f(x)=2\sqrt{x}-x$.

e) $f(x)=\dfrac{x}{\ln x}$.

f) $f(x)=\dfrac{e^x}{x}$.

g) $f(x)=xe^x$.

Exercise 4. *For the following functions find the global maximum/minimum in the given interval.*

- $f(x)=x+\sqrt{x}, \quad [0,4]$.
- $f(x)=x-2\ln x, \quad [1,e]$.

– $f(x) = \sqrt{4-x}, \quad -2, 2]$.

Exercise 5. *For the following functions find all the inflection points.*

1. $f(x) = 3x^5 - 5x^4 + 3x - 2$.
2. $f(x) = x\mathrm{e}^x$.
3. $f(x) = x^2 \ln x$.

Exercise 6. *Plot the graph of the following functions, in the given interval.*

1. $f(x) = 9x^3 - 4x, \quad \mathbb{R}$.
2. $f(x) = \dfrac{x}{3} - \dfrac{3}{x}, \quad]0, 10]$.
3. $f(x) = \dfrac{1}{x^2+1}, \quad [-5, 5]$.